message includes plural elements and wherein all elements in said message have element type indicators selected from an encoding group having a predetermined number of members, with at least two of said members designating elements containing other elements having element type indicators belonging to said group; and

invoking said service in response to said request.

127. A method of invoking a service at a first machine from a second machine, comprising the steps of:

generating a service invocation request message at said second machine in compliance with a markup language-based message encoding, wherein said message includes plural elements and wherein all elements in said message have element type indicators selected from an encoding group having a predetermined number of members, including at least a first element type indicator for designating an element containing data, and a second element type indicator for designating an element containing a set of elements having element type indicators selected from said group; and

transmitting said message .

128. A method of invoking a service at a first machine, comprising the steps of:

receiving at said first machine a service invocation request message generated at a second machine in compliance with a markup language-based message encoding, wherein said message includes plural elements and wherein all elements in said message have element type indicators selected from an encoding group having a predetermined number of members, including at least a first element type indicator for designating an element containing data, and a second element type indicator for designating an element containing a set of elements having element type indicators selected from said group; and

invoking said service in response to said message.

129. A method of invoking a service at a first machine, said method comprising the steps of:

receiving at said first machine a service invocation request;

invoking said service in response to said request; and

transmitting from said first machine a service invocation reply message in compliance with a markup language-based message encoding, wherein said message includes plural elements and wherein all elements in said message have element type indicators selected from an encoding group having a predetermined number of members, including at least a first element type indicator for designating an element containing data, and a second element type indicator for designating an element containing a set of elements having element type indicators selected from said group.

130. A method of invoking a service at a first machine, said method comprising the steps of:

transmitting a service invocation request from a second machine; and

receiving at said second machine a service invocation reply message in compliance with a markup language-based message encoding, wherein said message includes plural elements and wherein all elements in said message have element type indicators selected from an encoding group having a predetermined number of members, including at least a first element type indicator for designating an element containing data, and a second element type indicator for designating an element containing a set of elements having element type indicators selected from said group.

131. A method according to claim any one of claims 127-130, wherein said encoding group further includes a third element type indicator for designating an element containing a set of elements having element type indicators selected from said group.

132. A method according to claim 131, wherein said encoding group includes a fourth element type indicator for designating an element containing a set of elements having element type indicators selected from said group.

133. A method according to claim 131, wherein said encoding group includes a fourth element type indicator for designating an element uniquely identifying another encoding element within a particular message.

134. A method according to claim 131, wherein said encoding group includes a fourth element type indicator for designating the absence of a data item.

135. A method according to claim 133, wherein said encoding group includes a fifth element type indicator for designating the absence of a data item.

136. A method according to claim 135, wherein said encoding group includes a sixth element type indicator for designating an element containing a set of elements having element type indicators selected from said group.

137. A method according to claim 131, wherein said third element type indicator designates an element containing an n-dimensional array (where n is an integer such that $n \geq 1$) of elements having element type indicators selected from said encoding group.

138. A method according to any one of claims 127-130, wherein said encoding provides a type label associated with an element having said first element type indicator.

139. A method according to claim 138, wherein an element of said first element type indicator with no type label is assumed to be a string type element.

140. A method according to claim 138, wherein said mark-up language is XML, said element type indicators are element type names, and said type label is expressed as an XML attribute on said element having said first element type indicator, with the data type of a data item contained in said element being designated by the value of said attribute.

141. A method according to claim 131, wherein said encoding group further includes a fourth element type indicator for designating an element representing a numeric value.

142. A method according to claim 131, wherein said encoding group includes multiple type names each designating a respective different type of data item contained in an element having said first type indicator.

143. A method according to claim 131, wherein said message further includes a semantic label for at least one data item contained in said message.

144. A method according to claim 143, wherein said mark-up language is XML and said semantic label is represented by the value of an XML attribute on the element containing said data item.

145. A method of invoking a service at a first machine from a second machine, said method comprising the steps of:

generating a service invocation request message at said second machine in compliance with a markup language-based message encoding wherein each element in said message is associated with a type indicator selected from a group of type indicators, said group including at least an array type indicator indicating that the corresponding element is an n-dimensional array containing a plurality of data items, where n is an integer and $n \geq 1$, said message including at least one data item which is a multi-level nested array element where each nesting level corresponds to a respective dimension of said array element; and

transmitting said service invocation request message from said second machine.

146. A method of invoking a service at a first machine, comprising the steps of:

receiving at said first machine a service invocation request message generated at a second machine in compliance with a markup language-based message encoding wherein each element in said message is associated with a type indicator selected from a group of type indicators, said group including at least an array type indicator indicating that the corresponding element is an n-dimensional array containing a plurality of data items, where n is an integer and $n \geq 1$, said message including at least one data item which is a multi-level nested array element where each nesting level corresponds to a respective dimension of said array element; and

invoking said service in response to said message.

147. A method of invoking a service at a first machine, said method comprising the steps of:

receiving at said first machine a service invocation request;

invoking said service in response to said request; and

transmitting from said first machine a service invocation reply message in compliance with a markup language-based message encoding wherein each element in said message is associated with a type indicator selected from a group of type indicators, said group including at least an array type indicator indicating that the corresponding

element is an n-dimensional array containing a plurality of data items, where n is an integer and n ≥ 1, said message including at least one data item which a multi-level nested array element where each nesting level corresponds to a respective dimension of said array element; and

transmitting said service invocation reply message from said second machine.

148. A method of invoking a service at a first machine, said method comprising the steps of:

transmitting a service invocation request from a second machine; and

receiving at said second machine a service invocation reply message in compliance with a markup language-based message encoding wherein each element in said message is associated with a type indicator selected from a group of type indicators, said group including at least an array type indicator indicating that the corresponding element is an n-dimensional array containing a plurality of data items, where n is an integer and n ≥ 1, said message including at least one data item which is a multi-level nested array element where each nesting level corresponds to a respective dimension of said array element.

149. A method of invoking a service at a first machine from a second machine, said method comprising the steps of:

generating a service invocation request message at said second machine in compliance with a markup language-based message encoding wherein each element in said message is associated with a type indicator selected from a group of type indicators, said group including at least an array type indicator indicating that the corresponding element is an n-dimensional array containing a plurality of data items, where n is an integer and n ≥ 1, said request message including at least one data item which is an array of dimension n and a label associated with said data item and designating said data item

as having an array type, said label indicating a value of n but not indicating a size for each of said n dimensions; and

transmitting said service invocation request message from said second machine.

150. A method of invoking a service at a first machine, comprising the steps of:

receiving at said first machine a service invocation request message generated at a second machine in compliance with a markup language-based message encoding wherein each element in said message is associated with a type indicator selected from a group of type indicators, said group including at least an array type indicator indicating that the corresponding element is an n-dimensional array containing a plurality of data items, where n is an integer and $n \geq 1$, said request message including at least one data item which is an array of dimension n and a label associated with said data item and designating said data item as having an array type, said label indicating a value of n but not indicating a size for each of said n dimensions; and

invoking said service in response to said message.

151. A method of invoking a service at a first machine, said method comprising the steps of:

receiving at said first machine a service invocation request;

invoking said service in response to said request; and

transmitting from said first machine a service invocation reply message in compliance with a markup language-based message encoding wherein each element in said message is associated with a type indicator selected from a group of type indicators, said group including at least an array type indicator indicating that the corresponding element is an n-dimensional array containing a plurality of data items, where n is an integer and $n \geq 1$, said reply message including at least one data item which is an array of dimension n and a label associated with said data item and designating said data item as having an array type, said label indicating a value of n but not indicating a size for each of said n dimensions; and

transmitting said service invocation reply message from said second machine.

152. A method of invoking a service at a first machine, said method comprising the steps of:

transmitting a service invocation request from a second machine; and

receiving at said second machine a service invocation reply message in compliance with a markup language-based message encoding wherein each element in said message is associated with a type indicator selected from a group of type indicators, said group including at least an array type indicator indicating that the corresponding element is an n-dimensional array containing a plurality of data items, where n is an integer and $n \geq 1$, said reply message including at least one data item which is an array of dimension n and a label associated with said data item and designating said data item as having an array type, said label indicating a value of n but not indicating a size for each of said n dimensions.

153. A method of invoking a service at a first machine from a second machine, said method comprising the steps of:

generating a service invocation request message at said second machine in compliance with a mark-up language-based message encoding wherein each element in said message is associated with a type indicator selected from a group including at least

an array type indicator indicating that the corresponding element is an n-dimensional array containing a plurality of data items, where n is an integer and $n \geq 1$, said request message including at least one data item which is an array of dimension n and a label associated with said data item and designating said data item as having an array type, said encoding requiring that all data items contained within said array as direct children have the same type as one another; and

transmitting said service invocation request message from said second machine.

154. A method of invoking a service at a first machine, comprising the steps of:

receiving at said first machine a service invocation request message generated at a second machine in compliance with a markup language-based message encoding wherein each element in said message is associated with a type indicator selected from a group including at least an array type indicator indicating that the corresponding element is an n-dimensional array containing a plurality of data items, where n is an integer and $n \geq 1$, said request message including at least one data item which is an array of dimension n and a label associated with said data item and designating said data item as having an array type, said encoding requiring that all data items contained within said array as direct children have the same type as one another; and

invoking said service in response to said message.

155. A method of invoking a service at a first machine, said method comprising the steps of:

receiving at said first machine a service invocation request;

invoking said service in response to said request; and

transmitting from said first machine a service invocation reply message in compliance with a markup language-based message encoding wherein each element in said message is associated with a type indicator selected from a group including at least an array type indicator indicating that the corresponding element is an n-dimensional array containing a plurality of data items, where n is an integer and $n \geq 1$, said reply

message including at least one data item which is an array of dimension n and a label associated with said data item and designating said data item as having an array type, said encoding requiring that all data items contained within said array as direct children have the same type as one another; and

transmitting said service invocation reply message from said second machine.

156. A method of invoking a service at a first machine, said method comprising the steps of:

transmitting a service invocation request from a second machine; and

receiving at said second machine a service invocation reply message in compliance with a markup language-based message encoding wherein each element in said message is associated with a type indicator selected from a group including at least an array type indicator indicating that the corresponding element is an n-dimensional array containing a plurality of data items, where n is an integer and $n \geq 1$, said reply message including at least one data item which is an array of dimension n and a label associated with said data item and designating said data item as having an array type, said encoding requiring that all data items contained within said array as direct children have the same type as one another.

157. A method according to any one of claims 153-156, wherein said label identifies said same type.

158. A method according to any one of claims 149-156, wherein said mark-up language is XML, and said label is expressed as an XML attribute of said element such that the dimension n is given by the value of the attribute

159. A method according to any one of claims 149-156, wherein said message is an XML document.

160. A method according to any one of claims 145-148, wherein said message includes a label associated with said data item and designating said data item as having an array type.

161. A method according to claim 160, wherein each of said second array elements includes at least one data item, with all data items in each of said second array elements being of the same type as one another.

162. A method according to claim 161, wherein said label indicates the type associated with all data items contained in said array.

163. A method according to any one of claims 149-156, wherein said label indicates a value of n but does not indicate a size for each of said n dimensions.

164. A method according to any one of claims 145-148, wherein said message includes a label associated with said data item and designating said data item as having an array type, said encoding requiring that all data items contained within said array as direct children have the same type as one another.

165. A method of invoking a service at a first machine from a second machine, said method comprising the steps of:

generating a service invocation request message at said second machine in compliance with a markup language-based message encoding, wherein each element in said message is associated with an element type indicator selected from a group including at least first and second element type indicators, wherein said message associates an element having said first type indicator with an ID value, and wherein said message includes an element having said second type indicator which specifies said ID value; and

transmitting said service invocation request message from said second machine.

166. A method of invoking a service at a first machine, comprising the steps of:

receiving at said first machine a service invocation request message generated at a second machine in compliance with a markup language-based message encoding, wherein each element in said message is associated with an element type indicator selected from a group including at least first and second element type indicators , wherein said message associates an element having said first type indicator with an ID value, and wherein said message includes an element having said second type indicator which specifies said ID value; and

invoking said service in response to said message.

167. A method of invoking a service at a first machine, said method comprising the steps of:

receiving at said first machine a service invocation request;

invoking said service in response to said request; and

transmitting from said first machine a service invocation reply message in compliance with a markup language-based message encoding, wherein each element in said message is associated with an element type indicator selected from a group including at least first and second element type indicators, wherein said message associates an element having said first type indicator with an ID value, and wherein said message includes an element having said second type indicator which specifies said ID value; and

transmitting said service invocation reply message from said second machine.

168. A method of invoking a service at a first machine, said method comprising the steps of:

transmitting a service invocation request from a second machine; and

receiving at said second machine a service invocation reply message in compliance with a markup language-based message encoding, wherein each element in said message is associated with an element type indicator selected from a group including at least first and second element type indicators, wherein said message associates an

element having said first type indicator with an ID value, and wherein said message includes an element having said second type indicator which specifies said ID value.

169. A method of invoking a service at a first machine from a second machine, said method comprising the steps of:

generating a service invocation request message at said second machine in compliance with a markup language-based message encoding, wherein each element in said message is associated with an element type indicator selected from a group, said group including at least one placeholder element type indicator that designates a placeholder element which represents the absence of data; and

transmitting said service invocation request message from said second machine.

170. A method of invoking a service at a first machine, comprising the steps of:

receiving at said first machine a service invocation request message generated at a second machine in compliance with a markup language-based message encoding, wherein each element in said message is associated with an element type indicator selected from a group including at least one placeholder element type indicator that designates a placeholder element which represents the absence of data; and

invoking said service in response to said message.

171. A method of invoking a service at a first machine, said method comprising the steps of:

receiving at said first machine a service invocation request;

invoking said service in response to said request; and

transmitting from said first machine a service invocation reply message in compliance with a markup language-based message encoding, wherein each element in said message is associated with an element type indicator selected from a group, said group including at least one placeholder element type indicator that designates a placeholder element which represents the absence of data; and

transmitting said service invocation reply message from said second machine.

172. A method of invoking a service at a first machine, said method comprising the steps of:

transmitting a service invocation request from a second machine; and

receiving at said second machine a service invocation reply message in compliance with a markup language-based message encoding, wherein , wherein each element in said message is associated with an element type indicator selected from a group including at least one placeholder element type indicator that designates a placeholder element which represents the absence of data.

173. A method according to any one of claims 169-172, wherein said placeholder element represents a programming language null object reference.

174. A method according to any one of claims 169-172, wherein said placeholder element identifies a data item contained elsewhere in said message.

175. A method according to any one of claims 165-168, wherein said message includes a type label associated with said placeholder element.

176. A method according to any one of claims 165-168, wherein said message includes a semantic label associated with said placeholder element.

177. A method according to claim 175, wherein said message includes a semantic label associated with said placeholder element.

178. A method according to any one of claims 165-168, wherein said encoding permits any data item in a message to be associated with an ID which uniquely identifies said data item within said message.

179. A method according to claim 178, wherein said mark-up language is XML, and said ID is associated with a data item via an XML attribute on said data item whose value is said ID.